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CENTRAL INTELLIGENCE AGENCY

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THIS IS UNEVALUATED INFORMATION

1. In addition to the study of selenium, silicon, germanium, and Three-Five (sic) compounds, research work in the Academy Institute for Research on the Physics of Solids in Berlin-Buch has been concentrated on the study of cadmium sulfide (CdS) since 1950. In late 1950 and early 1951, Wilhelm Muscheid of the Optical Department of the Institute investigated the influence of the temperature on the photo-conductivity and dark conductivity of CdS crystals in the range from ambient temperature to 400° Centigrade. He obtained reproducible (reproduzierbare) curves; i.e., curves having the same characteristics with the temperature increasing or decreasing. At about the same time, W. W. Buttler of the Optical Department was engaged in measuring the noise (Rauschen) of CdS cells and he determined that the noise probably comes from the transition layer (Uebergangsschicht) of the crystal and the electrodes. Further investigation by Buttler and Muscheid furnished the exact proof for this preliminary result in the fall of 1953.

2. Dr. Josef Fassbender[1], head of the Optical Department (later Electro-Optical Department) in 1951 and early 1952, studied the potential distribution in CdS cells. His measurements showed that distinct jumps of the potential existed near the electrodes of CdS cells [4] Fassbender, in cooperation with Bernard Seraphin[2], also studied the rise and decay of the photo-current in CdS cells. Seraphin found that a relatively simple approximation formula which had been known before[3] could be used for the description of the rise and decay of the photo-current. Seraphin later investigated the influence of the temperature and of oxygen pressure on the rise and decay of the photo-current. He found that as a first approximation the recombination coefficient alpha is independent from the temperature, whereas beta is strongly dependent upon the temperature and the oxygen pressure. In 1952, Muscheid investigated the influence of oxygen on the formation of adhesive spots (Haftstellen) in CdS monocrystals.

3. Until Fassbender left the Institute in the summer of 1952, he and Dr. Helmut Simon of the Institute's Department for Structure Research were engaged in the development of high-vacuum CdS cells. These cells had more stable qualities than the normal ones. However, they could only be produced in small numbers and at a very high reject rate: on the average, eight to nine out of ten cells were unserviceable. The problem of obtaining

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suitable cells became increasingly urgent because exact measurements turned out to be almost impossible due to the different "behavior" of different cells. It seemed obvious that the difficulties were at least to a great extent connected with the contacts of the cells. After Fassbender's departure, Muscheid became head of the Electro-Optical Department, and he and Buttler constructed an installation for measuring the Hall effect, the conductivity, the influence of the temperature on the noise, and the decrease of the photo-current through exposure of the cells to normal or spectrally decomposed light, and, at the same time, to infrared destruction(Ultrarotvertilgung). Contact difficulties, however, prevented Muscheid and Buttler from obtaining exact results. From the summer of 1952 on, they therefore concentrated their work on developing suitable cells with aluminum, gold, and platinum contacts. Only in early 1953 could suitable cells be produced at a reasonable reject rate. Muscheid and Buttler found that the quality of the cells would be considerably increased through exposing the CdS crystal to bombardment by extremely small particles, such as electrons, either before or during the fixing of the electrodes. The electrodes were either steamed on the crystals or deposited by cathode atomizing. In these cells, not only were the contact difficulties greatly reduced but also their sensitivity was increased from three to five times. They also have stable qualities and Ohm characteristics 5 The relation between noise current and signal current is smaller by powers of ten than in the old cells. Other characteristics are: the distance between the two electrodes is 0.5 millimeter; on the average, a photo-current from 5 to 10 milliamperes is obtained with 6V voltage and 10,000 Lux light intensity; the potential distribution does not show jumps in the electrode regions the reject rate is only about 5 percent. Compared with West and other East German standard products, they show definite advantages, as was found through comparing them with CdS cells produced by VEB Carl Zeiss, Jena, and by the Bruno Lange Firm in Berlin-Zehlendorf.6 After the development of these cells was successfully completed, their production in greater numbers was started. In June 1954, the Institute had orders for hundreds of cells for relay and measurement purposes from other scientific institutes and from industrial firms, such as the Medizinische Geraetefabrik in East Berlin.

4. Dipl. Phys. Brauer was engaged in June 1954 in measuring the rise and decay of the photo-currents in the new CdS cells after he improved - between summer 1953 and June 1954 - the installation previously built by Seraphim. Dipl. Phys. Ingrid Peppe has been engaged since 1953 in measuring the potential of the new cells. In June 1954 she was engaged in a study concerning the spectrographic measurement of the influence of the temperature on the luminescence of CdS crystals. Other scientists in the Electro-Optical Department at that time were using, together with Buttler, the improved CdS cells for measuring the Hall effect, conductivity, relations between temperature and noise and the effect of infrared radiation on the photo-current with the installation mentioned above, built by Muscheid and Buttler.

5. Dipl. Chem. Udo Holland-Nell, first with the Chemical and later with the Electro-Optical Department of the Institute, is in charge of CdS crystal growing. In June 1954 he was engaged in building an installation for growing crystals with defined qualities bearing on the spectrographic distribution of the photo-sensitivity, the intensity of the dark current, the speed of the photo-current rise and decay, etc. His work met with many difficulties, and the task assigned him was far from being solved at that time.

3. Comment. The formula in question is

$$\frac{dn}{dt} = \text{const} - \text{alpha} \times n - \text{beta} \times n^2$$

Where n is the number of conducting electrons, alpha and beta are recombination coefficients, and the constant is determined by the number of light quanta per second and/per square centimeter.

4. [redacted] Comment: In both instances, the German word [redacted] (outer layers, rim zones) was used.

5. [redacted] Comment: Probably resistance characteristics is meant.

6. [redacted] Comment: Listed in the [redacted] fuer Berlin 1952 as Dr. Bruno Lange, Spezialfabrik [redacted] und Apparate, Zehlendorf, Hermannstrasse 140[redacted], telephone 84 [redacted].

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